



Devoted to Protection®

PROMOTING
GLOBAL WIND TURBINE
EFFICIENCY



DEVOTED TO PROTECTION[®]

A FOUNDATION OF BEING FIRST

AMSOIL specializes in developing synthetic lubricants that offer innovative answers to the greatest challenges equipment presents. The extraordinary performance of AMSOIL synthetic lubricants in a range of global markets has made our influence in the industry unmistakable and our brand highly respected.

- **First** recommended practice oil-change flushing procedure written for American Wind Energy Association (AWEA)
- **First** to address wind turbine gearbox foaming
- **First** to develop extended-life lubricants without the need for additional top treatments
- **First** synthetic oil for diesel, racing, marine and turbocharged engines
- **First** API-qualified 100-percent synthetic motor oil
- **First** extended-drain oil recommended for 25,000-mile/12-month drain intervals
- **First** 100:1 pre-mix 2-cycle oil
- **First** synthetic gear lube for automotive use
- **First** synthetic automatic transmission fluid

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DEMAND QUALITY. DEMAND PROTECTION. DEMAND AMSOIL.

AMSOIL Synthetic Power Transmission Gear Lube protects longer than any other gearbox lubricant on the market – without the use of top treats. With more than ten years of proven results and an industry-leading warranty, we’ve captured the attention of asset managers who want to reduce downtime and maintenance costs. The OEMs are now following owner/operators’ lead and transitioning to AMSOIL products on a global scale. You now have a choice previously unavailable from your OEM.

The global leader in wind gearbox oil reliability and performance.



FIND OUT MORE AT [AMSOILWIND.COM](https://www.amsoilwind.com)

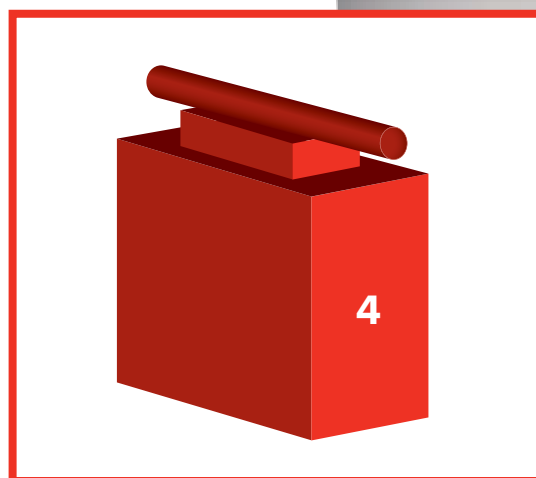
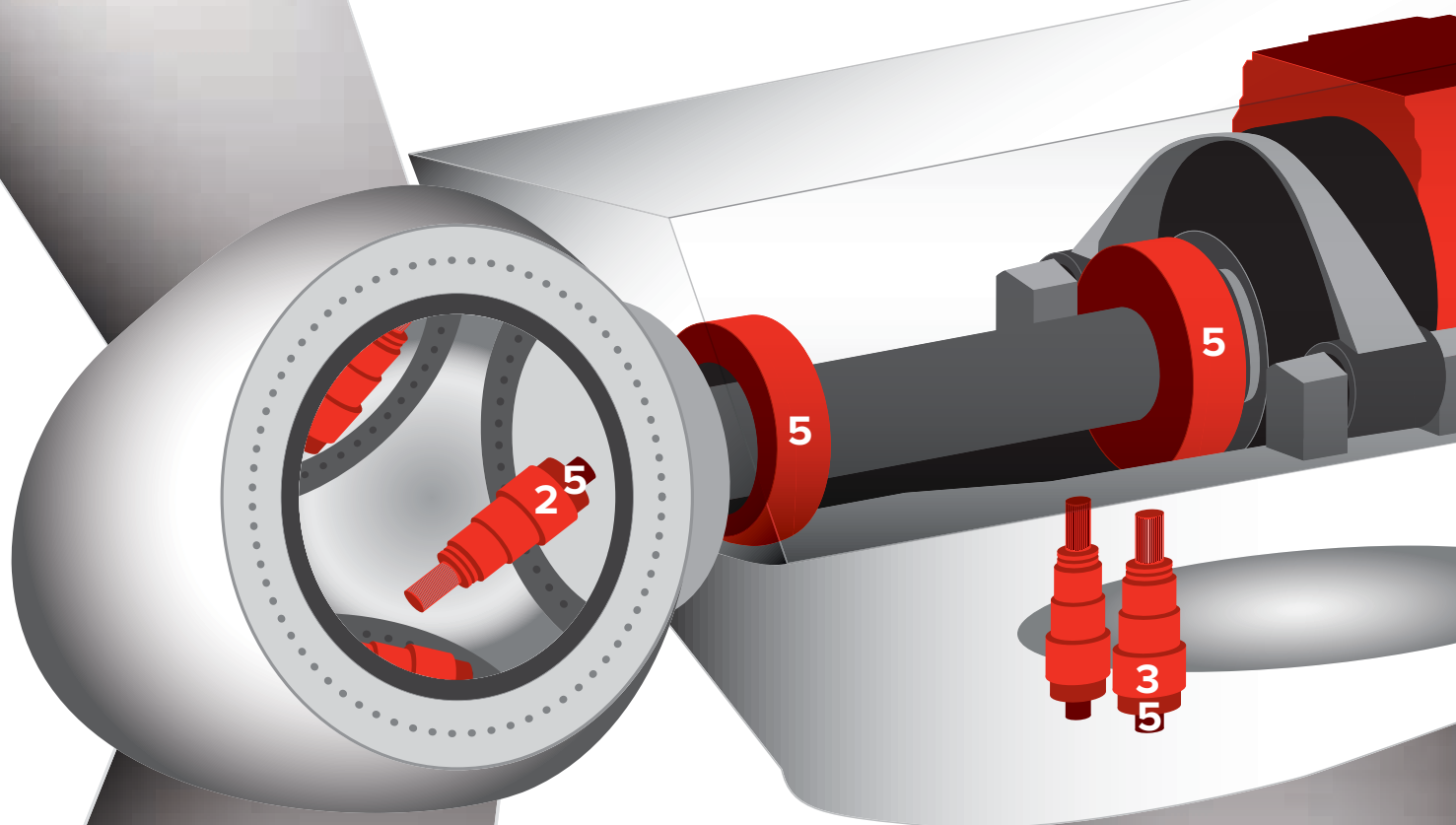
You’ll also find up-to-date information on manufacturer approvals, product compatibility, approved oil-change vendors and technical articles.

DEVOTED TO

AMSOIL SYNTHETIC POWER TRANSMISSION EP
GEAR LUBE HAS AN

**INDUSTRY-LEADING,
LONG-TERM WARRANTY.**

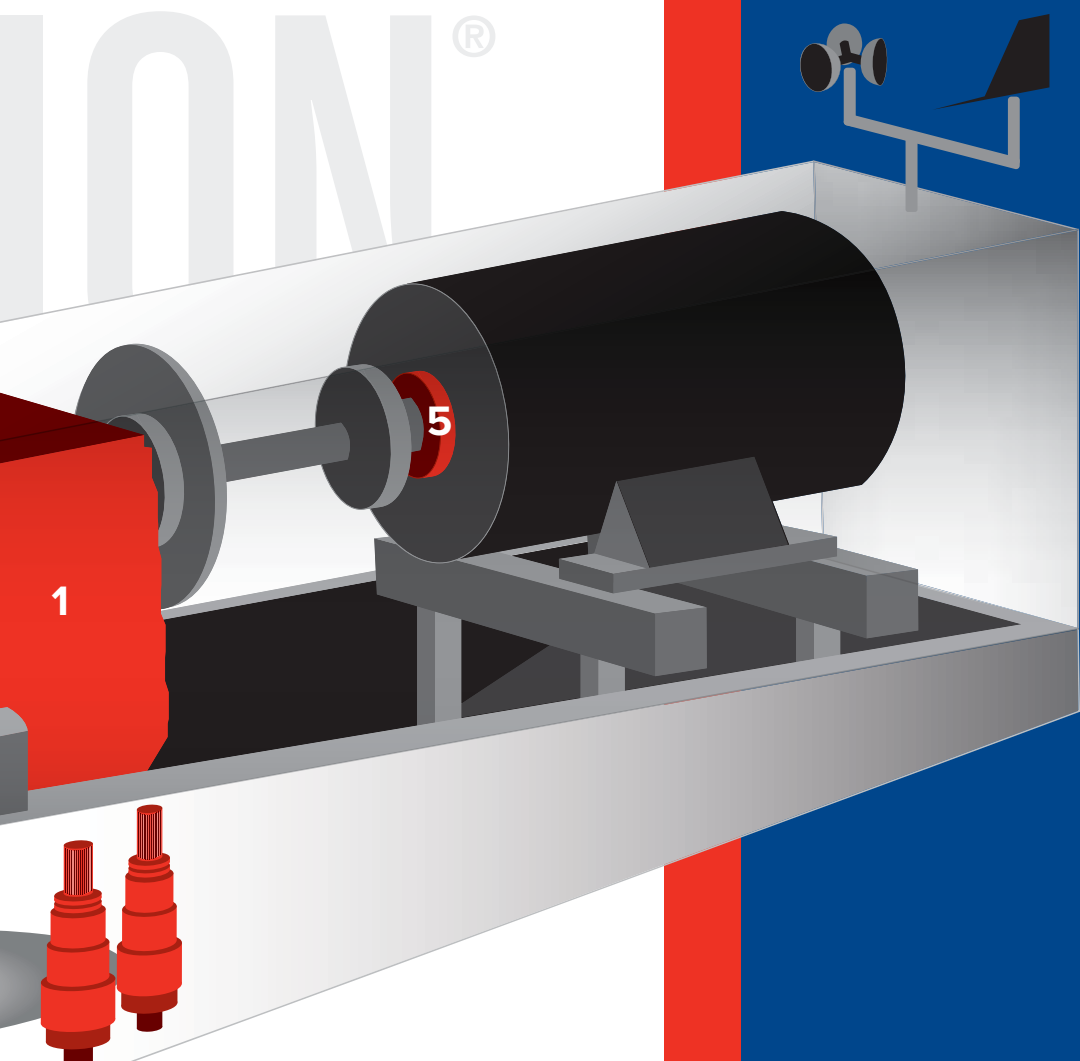
PROTECT





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ION®



- 1 MAIN GEARBOX**
PT Series (PTN, PTENX, PTO)
- 2 PITCH GEARBOX**
PT Series (PTL, PTM, PTN)
SG Series (SGL, SGM, SGN)
RC Series (RCL, RCM, RCN)
- 3 YAW GEARBOX**
PT Series (PTL, PTM, PTN)
SG Series (SGL, SGM, SGN)
RC Series (RCL, RCM, RCN)
- 4 HYDRAULIC SYSTEM**
AW Series
HV Series
HM Series
- 5 GREASE**
Main Bearing
Link Chain
Open Gear

AMSOIL ADVANTAGES

- Extended gearbox life
- Repels water
- Non-foaming
- Top micropitting protection
- No additive loss
- Extended filter life
- No corrosive wear
- No viscosity loss
- Extended oil life
- Outperforms competition for wear control in 13 field tests
- Three oil-change and flushing options
- Expert, fast-response consultation
- Highest manufacturing standards

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SYNTHETIC POWER TRANSMISSION EP GEAR LUBRICANTS

PT Series

Product Profile

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AMSOIL PT Series Synthetic Power Transmission EP Gear Lubricants are premium synthetic polyalphaolefin-type (PAO) gear oils engineered to provide maximum performance and protection in wind turbine and other industrial gearboxes operating under severe conditions. They are formulated with extreme-pressure (EP) additives for outstanding resistance to scuffing wear and micropitting fatigue on gear surfaces operating under extreme pressures and shock loads. AMSOIL Synthetic Power Transmission EP Gear Lubes provide exceptional thermal stability and oxidation resistance to fulfill the long oil life requirements of gearbox manufacturers, making them ideal for hard-to-reach places where gear oil changes are infrequent. AMSOIL PT Series lubricants are recommended for heavy-duty industrial gear drives, such as steel-on-steel helical, bevel and spur gears with surface-hardened tooth metallurgies.

AMSOIL PT Series Gear Lubes are fortified with next-generation additive technology to deliver outstanding overall performance in areas critical to industrial applications, including water resistance, filterability, long-term foam control, rapid air release, rust and corrosion inhibition and paint and seal compatibility.

MAXIMUM WEAR PROTECTION

AMSOIL PT Series Synthetic Gear Lubes are highly resistant to viscosity shear, even under extreme stress. They exceed the performance requirements for gear and bearing protection, while providing excellent film strength over a broad temperature range. Their excellent foam-resistance and air-release properties ensure strong fluid film thickness and reduced gear and bearing wear.

EXCELLENT FILTERABILITY

AMSOIL Synthetic Power Transmission EP Gear Lubes do not contain solids, allowing for filtration down to 5 microns using full-flow media, and 3 microns using bypass filtration for maximum filter life and oil cleanliness.

PRODUCT FEATURES	USER BENEFITS
Solids-free additive technology	Excellent protection against micropitting and scuffing wear. Can be subjected to ultra-fine filtration for maximum contaminant removal. Extended filter life for reduced costs.
Seal and elastomer compatible	Helps prevent leaks and extend seal, hose and gasket life.
PAO synthetic base oils	Improved oxidation resistance and extreme-temperature performance.
Water resistant	Resists water absorption in wet and humid environments. Improves filterability and filter life. Inhibits rust and corrosion.
Shear stable	Enhances viscosity retention and film thickness for dependable wear and EP protection.
Thermally stable	Inhibits sludge, carbon and varnish deposits for clean, efficient operation.
Internal coating compatibility	Can be used in multiple manufacturer-branded gearboxes.

TYPICAL TECHNICAL PROPERTIES

AMSOIL Synthetic Power Transmission EP Gear Lubricants (PT Series)

Stock Code	PTM	PTN	PTENX	PTO
ISO Viscosity Grade (ASTM D2422)	220	320	390	460
Kinematic Viscosity @ 100°C, cSt (ASTM D445)	26.0	34.8	40.1	47.9
Kinematic Viscosity @ 40°C, cSt (ASTM D445)	223.3	326.7	391.2	473.7
Viscosity Index (ASTM D2270)	148	151	153	160
Specific Gravity (ASTM D1298)	0.8607	0.8618	0.8607	0.8649
API Gravity (ASTM D1298)	32.9	32.7	32.9	32.1
Density (lb/gal) (ASTM D1298)	7.167	7.176	7.167	7.202
Color (ASTM D1500)	L1.5	L1.5	L1.5	L1.5
Clarity	Clear	Clear	Clear	Clear
Four-Ball Wear Test (ASTM D4172)				
(75°C, 1200 rpm, 40 kg, 1hr)	0.33	0.33	0.33	0.33
(150°C, 1800 rpm, 40 kg, 1hr)	0.37	0.37	0.37	0.37
(54°C, 1800 rpm, 20 kg, 1hr)	0.24	0.24	0.24	0.24
Moisture (ppm) (ASTM D6304C)	< 100	< 100	< 100	< 100
Falex B (Failure), LbF (ASTM D3233)	1750	1750	1750	1750
TAN (ASTM D664)	0.48	0.48	0.48	0.48
Foam Tendency (ASTM D892)	0/0/0	0/0/0	0/0/0	0/0/0
Copper Corrosion 121°C, 3 hr (ASTM D130)	1B	1B	1B	1B
Copper Corrosion 100°C, 3 hr (ASTM D130)	1A	1A	1A	1A
FZG Micropitting Test [FVA 54]	10	>10	>10	>10
(GFT Class)	High	High	High	High
FZG Scuffing Load Test [A/8, 3/90] (Pass)	14+	14+	14+	14+
FZG Scuffing Load Test [A/16, 6/90] (Pass)	14+	14+	14+	14+
FAG FE-8 Bearing Test [DIN 51819-3] (7.5 speed, 80kN load, 80 hr)				
Roller Wear (Mw50), mg	3	–	–	–
FAG FE-8 High Load Bearing Wear Test (7.5 speed, 100kN load, 80 hr)				
Roller Wear (Mw50), mg	–	<1	–	–
Flash Point °C (°F) (COC) (ASTM D92)	242 (468)	245 (473)	246 (475)	250 (482)
Fire Point °C (°F) (COC) (ASTM D92)	274 (525)	276 (529)	280 (536)	280 (536)
Pour Point °C (°F) (ASTM D97)	-40 (-40)	-38 (-36)	-36 (-33)	-35 (-31)

LIST OF APPROVALS	PTM	PTN	PTENX	PTO
ISO VG	220	320	390	460
GE Renewable Energy	–	X	–	–
SIEMENS Gamesa Renewable Energy	–	X	–	–
Winergy	–	X	–	–
Flender	X	X	–	X
NGC Gear	–	X	–	–
ZF Wind Power	–	X	–	–
Bosch Rexroth	–	X	–	–
Moventas	–	X	–	–
Envision	–	X	–	–
Ming Yang	–	X	–	–
Hangzhou Advance Gear	–	X	–	–
Gearbox Express - Revolution	–	X	–	–
Eickhoff	–	X	–	–
GE Transportation (GETS)	–	X	–	–
Brevini	–	X	–	–
WIKOV	–	X	–	–
ANSI/AGMA 9005-F16 (EP)	X	X	X	X
ISO 12925-1 Type CKD	X	X	X	X
DIN 51517 Part 3	X	X	X	X
David Brown S1.53.101 Type E	X	X	X	X
SEB 181226	X	X	X	X
US Steel/AIST 224	X	X	X	X

APPLICATIONS

AMSOIL PT Series Synthetic Power Transmission EP Gear Lubes are designed to provide outstanding protection for wind turbine and other industrial gearboxes that require EP protection, such as those found in the textile, paper, steel, cement, plastic and lumber industries. AMSOIL PT Series Gear Lubes are formulated to meet the listed standards and requirements.

HEALTH & SAFETY INFORMATION

For recommendations on safe handling and use of these products, please refer to the Safety Data Sheet (SDS), which is available upon request through the AMSOIL Wind Group at windsalesgroup@amsoil.com or (715) 399-6305.



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CLEANING AGENT

Stock Code: AM2110

Product Profile

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AMSOIL Cleaning Agent is non-solvent-based and assists in cleaning gearboxes of sludge, varnish or additive fallout caused by previously used gear oils. AMSOIL Cleaning Agent does not harm seals or internal coatings in gearboxes when used according to the guidelines below.

GUIDELINES FOR USE

Follow these guidelines when using AMSOIL Cleaning Agent. Failure to do so may result in equipment damage.

- Treat Rate: 6 - 6.5% (5 gallons of AMSOIL Cleaning Agent per 75-80 gallons of gear oil).
- Gear oil must not contain >2% water (2000 ppm).
- Treatment Time: Best results when used in an operating turbine for a minimum of three and as many as seven days. Do not exceed 10 days.
- Conduct the AMSOIL flushing procedure after treatment and refill with AMSOIL Synthetic Power Transmission EP Gear Lube (PTN). The flushing procedure is available from the AMSOIL Wind Group using the contact information below.

HEALTH & SAFETY INFORMATION

For recommendations on safe handling and use of these products, please refer to the Safety Data Sheet (SDS), which is available upon request through the AMSOIL Wind Group at windsalesgroup@amsoil.com or (715) 399-6305.

TYPICAL TECHNICAL PROPERTIES

Cleaning Agent (AM2110)

Kinematic Viscosity @100°C, cSt (ASTM D445)	6.15
Kinematic Viscosity @40°C, cSt (ASTM D445)	82.93
API Gravity, (ASTM D1298)	11.9
SpGr (ASTM D1298)	0.9868
Density, (lb/gal) (ASTM D1298)	8.218
Color, (ASTM D1500)	L0.5
Clarity	Clear
Flash Point, °C (COC) (ASTM D92).	200
Fire Point, °C (COC) (ASTM D92)	214
Pour Point, °C (ASTM D97)	-21



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POWER TRANSMISSION FLUSHING OIL

Stock Code: AM1194

Product Profile

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AMSOIL Power Transmission Flushing Oil (AM1194) is a low-cost ISO viscosity grade 320 extreme-pressure (EP) flushing oil designed for flushing contaminants from wind turbine gearboxes during the oil-change process. It contains chemistry similar to AMSOIL Synthetic Power Transmission EP Gear Lube (PTN), ensuring compatibility.

GUIDELINES FOR USE

Please contact the AMSOIL Wind Group for your specific application guidelines. AMSOIL Power Transmission Flushing Oil is not designed to be a long-term gear oil replacement. It is meant to be used only as a flushing gear oil when changing to AMSOIL PTN.

HEALTH & SAFETY INFORMATION

For recommendations on safe handling and use of these products, please refer to the Safety Data Sheet (SDS), which is available upon request through the AMSOIL Wind Group at windsalesgroup@amsoil.com or (715) 399-6305.

TYPICAL TECHNICAL PROPERTIES

Power Transmission Flushing Oil (AM1194)

Viscosity @ 100°C, cSt (ASTM D445)	26.4
Viscosity @ 40°C, cSt (ASTM D445)	326.7
Viscosity Index (ASTM D2270)	106
Specific Gravity (ASTM D1298)	0.8783
Density, (lb/gal) (ASTM D1298)	7.314
Clarity	Clear
Flash Point, °C (°F) (ASTM D92)	260 (500)
Fire Point, °C (°F) (ASTM D92)	318 (604)
Pour Point, °C (°F) (ASTM D97)	-31 (-24)
Four-Ball Wear Test (ASTM D4172)	
(40 kg, 1200 rpm, 75°C, 1 hr), Scar, mm	0.39
(40 kg, 1800 rpm, 150°C, 1 hr), Scar, mm	0.51

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SYNTHETIC EXTREME-PRESSURE GEAR OIL

SG Series

Product Profile

DEVOTED TO PROTECTION®

AMSOIL SG Series Synthetic Gear Oil's advanced synthetic formulation is fortified with extreme-pressure (EP) additives to provide industrial-grade performance and protection. It is designed to exceed the increased protection needs of gears and bearings operating under severe-service and shock-loading conditions. SG Series Gear Oil delivers complete gearbox protection, with an emphasis on extreme-pressure gear protection, heat resistance and cold-temperature operability.

EXTREME-PRESSURE FORMULATION

SG Series Gear Oil is engineered to prevent metal-to-metal contact and inhibit corrosion. Its shear-stable, high-viscosity-index formulation features excellent anti-foam and air-release properties. SG Series Gear Oil maintains a thick lubricating film and is fortified with a heavy treatment of specialized sulfur/phosphorus EP and anti-corrosion additives. Under extreme pressures that may breach the lubricant film, an iron-sulfide barrier protects gear surfaces and inhibits wear, pitting and scuffing. SG Series Gear Oil demonstrates exceptional extreme-pressure performance in the FZG Scuffing and micropitting tests.

HIGH-TEMPERATURE DURABILITY

SG Series Gear Oil is formulated with durable base oils that are naturally resistant to oxidation. It also contains oxidation inhibitors and thermally stable additives for increased resistance to sludge formation, deposits, acid buildup and thermal degradation. AMSOIL SG Series Gear Oil is designed to deliver clean gears and housings throughout a long service life.

EXCELLENT COLD-TEMPERATURE FLUIDITY

SG Series Gear Oil's high viscosity index demonstrates excellent cold-flow properties and extremely low pour points. It helps improve cold-temperature efficiency, reducing the need for sump heaters and seasonal oil changes, while providing easier start-up for equipment.

APPLICATIONS & SPECIFICATIONS

The appropriate viscosity grade of AMSOIL SG Series Synthetic EP Gear Oil is recommended for applications requiring any of the following specifications:

	SGJ	SGK	SGL	SGM	SGN	SGO	SGP
DIN 51517-3			X	X	X	X	X
Cincinnati Machine	X	X	X	X	X	X	X
AGMA 9005-E02	X	X	X	X	X	X	X
ISO 12925-1 (CKD)	X	X	X	X	X	X	X
David Brown S1.53.101 (Type E)	X	X	X	X	X	X	X
US Steel 224	X	X	X	X	X	X	X
AGMA 250.04	X	X	X	X	X	X	X

SG Series Synthetic Extreme-Pressure Gear Oil

- Helps reduce maintenance costs due to excellent extreme-pressure protection
- Promotes long oil and component life by resisting thermal breakdown and water intrusion
- Increases cold-temperature efficiency and protection due to low pour points
- Designed to inhibit wear due to excellent film strength and foam suppression

TYPICAL TECHNICAL PROPERTIES

AMSOIL SG Series Synthetic Extreme-Pressure Gear Oil (SG Series)

Stock Code	SGJ	SGK	SGL	SGM	SGN	SGO	SGP
ISO Viscosity Grade (ASTM D2422)	68	100	150	220	320	460	680
AGMA EP Gear	2 EP	3 EP	4 EP	5 EP	6 EP	7 EP	8 EP
Kinematic Viscosity @ 100°C cSt (ASTM D445)	11.7	14.8	19.6	27	36.1	49.6	75.4
Kinematic Viscosity @ 40°C cSt (ASTM D445)	73.2	101.3	147.5	220.3	322.7	454	680.6
Viscosity Index (ASTM D2270)	155	151	152	157	158	170	192
Acid Number (ASTM D664)	0.66	0.66	0.66	0.66	0.66	0.66	0.66
Specific Gravity (ASTM D1298)	0.8529	0.8571	0.8607	0.8654	0.8676	0.8686	0.8633
Density – lb/gal (ASTM D1298)	7.102	7.137	7.167	7.207	7.224	7.233	7.189
Flash Point °C (°F) (ASTM D92)	238 (460)	238 (460)	238 (460)	240 (464)	244 (471)	246 (475)	254 (489)
Fire Point °C (°F) (ASTM D92)	280 (536)	282 (540)	286 (547)	282 (540)	288 (550)	286 (547)	312 (594)
Pour Point °C (°F) (ASTM D97)	-52 (-62)	-50 (-58)	-45 (-49)	-42 (-44)	-40 (-40)	-35 (-31)	-33 (-27)
Copper Strip Corrosion Test 121°C, 3 hours (ASTM D130)	1B	1B	1B	1B	1B	1B	1B
Rust procedure (ASTM D665 A&B)	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Oxidation Testing 121°C 13 days, % viscosity increase @ 100°C (ASTM D2893)	2.57%	2.63%	2.06%	3.04%	3.64%	3.58%	3.58%
Foam Seq I, II, III (ASTM D892)	0/0, 10/0, 0/0	0/0, 10/0, 0/0	0/0, 10/0, 0/0	0/0, 10/0, 0/0	0/0, 0/0, 0/0	0/0, 10/0, 0/0	0/0, 30/0, 0/0
Demulsibility (ASTM D1401)	40-40-0 (25)	40-40-0 (25)	40-40-0 (25)	40-40-0 (25)	40-40-0 (25)	40-40-0 (25)	40-40-0 (25)
Micropitting @ 90°C Load Stage, GFT Classification (FVA 54)	-	-	>10 GFT = High	>10 GFT = High	>10 GFT = High	>10 GFT = High	>10 GFT = High
FZG Failure Stage (A/8.3/90)	>12	>12	>12	>12	>12	>12	>12
FZG Failure Stage (A/16.6/90)	-	-	>12	>12	>12	>12	>12
FAG FE-8 Bearing Test (DIN 51589-3)	-	-	Pass	Pass	Pass	Pass	Pass

APPLICATION RECOMMENDATION

AMSOIL SG Series Synthetic EP Gear Oil is recommended for industrial gearboxes, including wind turbine pitch and yaw systems, operating under heavy loads and shock-loading conditions and specifying an extreme-pressure lubricant. This includes, but is not limited to, enclosed industrial spur, bevel, herringbone and helical gears, chain drives and sprockets requiring extreme-pressure additives. It is excellent for use in severe operating conditions, and its synthetic properties make it a good all-season lubricant.

Note: AMSOIL SG Series Synthetic EP Gear Oil is not recommended for automotive hypoid gears. It is not recommended for use with yellow metals (copper, brass, bronze) above 100°C (212°F) without further testing in the application. AMSOIL SG Series Synthetic EP Gear Oil is not compatible with polyglycol (PAG)-type gear oils. Thorough flushing prior to changeover from polyglycols is required.

COMPATIBILITY

AMSOIL SG Series Synthetic EP Gear Oil is compatible with conventional petroleum oils and other synthetic lubricants, including brands popular in wind turbine operations. Contact your wind representative to discuss specific compatibility scenarios.

HEALTH & SAFETY INFORMATION

For recommendations on safe handling and use of these products, please refer to the Safety Data Sheet (SDS), which is available upon request through the AMSOIL Wind Group at windsalesgroup@amsoil.com or (715) 399-6305.



MULTI-VISCOSITY ASHLESS HYDRAULIC OIL

HMV Series

Product Profile

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Multi-Viscosity Ashless Hydraulic Oil is designed to provide an extra measure of protection at a lower cost compared to other multi-viscosity oils. It features a high viscosity index for superior performance in hot and cold temperatures, reducing the need for seasonal change-outs. Multi-Viscosity Ashless Hydraulic Oil offers excellent wear protection for pumps and motors, while its ashless formulation is safer for the environment. It is compatible with other hydraulic oils, providing a safe option as a top-off oil. It is priced to help operators save money while improving performance.

FEATURE	BENEFIT
Highly compatible with zinc and non-zinc hydraulic oils	Simple to use and eases worries over compatibility issues
High viscosity index	Delivers excellent high- and low-temperature performance
Outstanding anti-wear protection, as demonstrated by high FZG anti-scuffing and pump wear test results	Protects against pump and motor wear for long life and reduced maintenance
Readily separates from water	Eases water removal and improves filterability
Doesn't contain heavy metals	Safer for the environment

TYPICAL TECHNICAL PROPERTIES			
AMSOIL Multi-Viscosity Ashless Hydraulic Oil (HMV Series)			
Stock Code	HMVG	HMVH	HMVI
ISO Viscosity Grade (ASTM D2422)	22	32	46
VK 100°C cSt (ASTM D445)	5.7	7.0	8.9
VK 40°C cSt (ASTM D445)	22.9	32.2	47.3
Viscosity Index (ASTM D2270)	205	189	171
SpGr – (ASTM D1298)	0.8358	0.8408	0.8509
Density – lb/gal (ASTM D1298)	6.959	7.001	7.085
Flash Point °C (°F) (ASTM D92)	214 (417)	228 (442)	232 (450)
Fire Point °C (°F) (ASTM D92)	234 (453)	252 (486)	264 (507)
Pour Point °C (°F) (ASTM D97)	-53 (-63)	-51 (-60)	-48 (-54)
Four-Ball Wear Test (ASTM D4172) (40 kg, 1200 rpm, 75°C, 60 min.)	0.46	0.45	0.44
Copper Strip Corrosion Test (ASTM D130)	1A	1A	1A
Foam (ASTM D892) Sequence I, II, III Test End	10/0, 10/0, 10/0	0/0, 30/0, 0/0	0/0, 30/0, 0/0
Demulsibility (ASTM D1401) Oil/Water/Cuff (min)	40-40-0 (10)	40-40-0 (10)	40-40-0 (15)
FZG A/8, 3/90, Load Stage Fail	–	>12	>12

APPLICATIONS & SPECIFICATIONS

Use the correct viscosity grade of AMSOIL Multi-Viscosity Ashless Hydraulic Oil in high- and low-pressure gear, vane and piston stationary and mobile hydraulic systems, including those with bronze metallurgy. It is recommended for all types of applications, including wind turbine systems, requiring the following industry and equipment specifications:

	ISO 32	ISO 46
Parker Hannifin HF-0, HF-1, HF-2	X	X
DIN 51524 Part 3	X	X
Vickers I-286-S, M-2950-S	X	X

HEALTH & SAFETY INFORMATION

For recommendations on safe handling and use of these products, please refer to the Safety Data Sheet (SDS), which is available upon request through the AMSOIL Wind Group at windsalesgroup@amsoil.com or (715) 399-6305.

COMPATIBILITY

AMSOIL Multi-Viscosity Ashless Hydraulic Oil is compatible with conventional and synthetic lubricants, including brands popular in wind turbine operations.

AMSOIL MULTI-VISCOSITY ASHLESS HYDRAULIC OIL COMPATIBILITY CHART	
Chevron/Texaco Rando WM 32	X
Shell S2 V32	X
Mobil DTE 10 Excel	X
Shell Tellus S4 VX	X
Castrol Hyspin AWH-M	X
Castrol Hyspin AWH-M (Superclean)	X

See your wind representative for specific compatibility data for these and other lubricants.

VANE PUMP TEST

AMSOIL HMVH ISO VG 32 hydraulic oil exceeds the vane pump wear requirements of DIN 51524 Part 3.



Cam Ring Interior



Vanes

VANE PUMP TEST RESULTS	LOSS, MG	ALLOWED LOSS, MG (DIN 51524 PART 3)
Ring	3.7	≤ 120 mg
Vane	3.8	≤ 30 mg

RECOMMENDATIONS AND CONCLUSIONS

Recommended for use in mobile and stationary systems requiring the listed specifications.

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SYNTHETIC ANTI-WEAR HYDRAULIC OILS

AW Series

Product Profile

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AMSOIL Synthetic AW Series Anti-Wear Hydraulic Oils are shear-stable, long-life lubricants based on high-quality synthetic oil technology. These oils are formulated with a premium additive system that inhibits oxidation to help prevent acid formation and viscosity increase and inhibit rust and foam (providing smooth hydraulic operation). AW Oils contain a very effective zinc-based anti-wear/anti-oxidant additive that controls wear in high-speed, high-pressure vane and gear pumps while meeting the lubrication requirements of axial piston pumps with bronze-on-steel metallurgy. Improved pump efficiency can increase hydraulic power, reduce fuel consumption and improve productivity. AW Oils are designed for long life and can typically reduce maintenance costs by extending drain intervals and reducing labor costs, repairs and downtime.

AMSOIL SYNTHETIC BASE OIL TECHNOLOGY

AMSOIL synthetic base oils resist thermal and oxidative breakdown, reducing varnish deposits. The very high viscosity indices, low pour points and lack of paraffins (wax) make these good all-season lubricants well-suited for high and low temperature extremes. At high temperatures and pressures, AMSOIL AW Series Oils provide a good lubricating film and protect components against wear. During cold-temperature operation, equipment starts easier and the need for preheating with sump heaters is reduced. The AW Series base oils readily separate from water, preventing oil/water emulsions that inhibit lubrication and allow for easier water drainage from the sump.

PERFORMANCE FEATURES

- Anti-wear protection for high-pressure systems.
- Recommended for gear, vane and piston pumps.
- Contain rust, oxidation and foam inhibitors.
- Designed for extreme-temperature operation.
- Hydrolytically stable and readily separates from water.

APPLICATION RECOMMENDATION

The correct viscosity grades of AMSOIL Synthetic AW Series Anti-Wear Hydraulic Oils are recommended for high- and low pressure gear, vane and piston stationary and mobile hydraulic systems. They are excellent for general-purpose use where extended drain intervals are desired and in severe-duty operations where temperature extremes are encountered. AMSOIL AW Series Oils are compatible with hydraulic system seals, and most petroleum and synthetic hydraulic oils*. For optimum performance, it is recommended the system be thoroughly drained and, if warranted, cleaned prior to installation. Oil analysis is recommended to maximize oil drain intervals.

** Not compatible with phosphate ester, silicone, PAG or water-based fluids.*

APPLICATIONS

AMSOIL recommends Synthetic AW Series Anti-Wear Hydraulic Oils for use where the following specifications are required:

- Denison HF-0, HF-1 and HF-2
- Vickers M-2950-S and I-286-S
- Cincinnati Milacron P-68, P-69 and P-70
- U.S. Steel 127
- Racine, variable volume vane pumps
- DIN 51524, Parts 2 and 3 HLP22-HLP46
- ASTM D-6158 HV
- AFNOR E 48-603*
- Ford M6C32
- GM LH-04-1, LH-06-1 and LH-15-1
- Lee Norse 100-1
- Jeffrey No. 87
- BF Goodrich 0152
- Commercial Hydraulics*

** Except for PM-500 series silver-containing pumps, which require R&O additive systems.*

HEALTH & SAFETY INFORMATION

For recommendations on safe handling and use of these products, please refer to the Safety Data Sheet (SDS), which is available upon request through the AMSOIL Wind Group at windsalesgroup@amsoil.com or (715) 399-6305.

TYPICAL TECHNICAL PROPERTIES

Synthetic AW Series Anti-Wear Hydraulic Oils (AW Series)

Stock Code	AWG	AWH	AWI
ISO Viscosity Grade (ASTM D2422)	22	32	46
VK 100°C cSt (ASTM D445)	5.9	7.4	9.7
VK 40°C cSt (ASTM D445)	20.7	33.1	49.1
Viscosity Index (ASTM D2270)	256	200	188
SpGr (ASTM D1298)	0.8363	0.8453	0.8463
Density – lb/gal (ASTM D1298)	6.964	7.038	7.047
Flash Point °C (°F) (ASTM D92)	174 (345)	228 (442)	230 (446)
Fire Point °C (°F) (ASTM D92)	188 (370)	248 (478)	250 (482)
Pour Point °C (°F) (ASTM D97)	<-60 (<-76)	-51 (-60)	-46 (-51)
Four-Ball Wear Test (ASTM D4172) (40 kg, 1200 rpm, 75°C, 60 min.)	0.45	0.45	0.45
Copper Strip Corrosion Test (ASTM D130)	1A	1A	1A
Foam (ASTM D892) Sequence I, II, III Test End	0/0,0/0,0/0	0/0,0/0,0/0	0/0,0/0,0/0
Dielectric Strength (ASTM D877) Voltage, kV AC	43.6	46.2	45.4
Demulsibility (ASTM D1401) Oil/Water/Cuff (min)	40-40-0 (10)	40-40-0 (10)	40-40-0 (10)
Rust Test (ASTM D665 A & B) Fresh Water and Synthetic Sea Water	Pass	Pass	Pass





Devoted to Protection®

SYNTHETIC MULTI-VISCOSITY HYDRAULIC OIL

HV Series

Product Profile

DEVOTED TO PROTECTION®

AMSOIL Synthetic Multi-Viscosity Hydraulic Oil's blend of high-viscosity-index base oils and performance additives provides all-season protection and reliable operation in all types of hydraulic systems. Its proven wear resistance and varnish-control deliver maximum hydraulic system performance and life. Synthetic Multi-Viscosity Hydraulic Oil is additionally tailored to promote energy efficiency and foam suppression.

ALL-SEASON PERFORMANCE

Multi-Viscosity Hydraulic Oil is designed for all-season use. Each viscosity covers a broad operating temperature range, helping eliminate seasonal oil changes. Its low pour point ensures the oil flows more readily in cold temperatures than petroleum oils. Bearings and other components receive almost immediate lubrication at start up, reducing long-term wear, instances of pressure spikes and erratic operation as a result of poor fluidity. At high operating temperatures, Multi-Viscosity Hydraulic Oil resists thermal breakdown and maintains its protective viscosity, allowing formation of a strong lubricating film.

VARNISH-CONTROL TECHNOLOGY

Increased heat can cause varnish to form on metal surfaces, including valves, pumps and bearings. Its soft, sticky composition ultimately hardens into a harmful veneer that can reduce fluid flow, plug filters, stick valves and increase friction. Synthetic Multi-Viscosity Hydraulic Oil is fortified with anti-varnish additives that chemically react with the building blocks of varnish, inhibiting its formation. It helps hydraulic systems remain clean and long-lasting.

Synthetic Multi-Viscosity Hydraulic Oil

- Increases convenience and reduces costs due to all-season performance
- Formulated to reduce maintenance costs with anti-wear and anti-varnish chemistry
- Promotes maximum fluid life by resisting viscosity loss and chemical breakdown
- Designed to increase system performance and responsiveness through foam suppression and fast air-release properties
- Helps reduce energy costs due to high-viscosity-index, energy-efficient formulation

ALUMINUM BEAKER OXIDATION TEST

Tested April 2012



Leading Conventional Hydraulic Fluid (ISO 46)



AMSOIL Synthetic Multi-Viscosity Hydraulic Oil (ISO 46)

Excessive oxidation results in harmful deposits and varnish that cause a host of problems, including stuck valves and decreased efficiency. In severe oxidation testing, AMSOIL Synthetic Multi-Viscosity Hydraulic Oil resisted elevated heat and oxidation more effectively than the conventional fluid.

TYPICAL TECHNICAL PROPERTIES

AMSOIL Synthetic Multi-Viscosity Hydraulic Oil (HV Series)

Stock Code	HVG	HVH	HVI	HVJ
ISO Viscosity Grade (ASTM D2422)	22	32	46	68
Kinematic Viscosity @100°C cSt (ASTM D445)	5.2	6.5	8.5	11.2
Kinematic Viscosity @40°C cSt (ASTM D445)	23.6	31.8	46.7	68.5
Viscosity Index (ASTM D2270)	161	165	161	155
Flash Point °C (°F) (ASTM D92)	228 (442)	224 (435)	246 (475)	252 (486)
Fire Point °C (°F) (ASTM D92)	242 (468)	246 (475)	266 (511)	270 (518)
Pour Point °C (°F) (ASTM D97)	-49 (-56)	-46 (-51)	-44 (-47)	-41 (-42)
Four-Ball Wear Test (ASTM D4172) (40 kg, 1200 rpm, 75°C, 60 min.)	0.42	0.42	0.41	0.41
Copper Strip Corrosion Test 100°C, 3 hrs. (ASTM D130)	1A	1A	1A	1A
Foam (ASTM D892, Sequence I, II & III)	0/0,10/0,0/0	0/0,10/0,0/0	0/0,10/0,0/0	0/0,35/0,0/0
Demulsibility (ASTM D1401)	40-40-0 (20)	40-40-0 (25)	40-40-0 (20)	40-40-0 (20)
Seal Tests Elastomer SRE-NBR 1, 100°C, 168 hrs. (ASTM D471)	Pass	Pass	Pass	Pass
Rust Testing				
Distilled and Salt Water (ASTM D665A & B)	Pass	Pass	Pass	Pass
KRL Shear Test, 15% Max KV loss, Stay-in-Grade	Pass	Pass	Pass	Pass

ANTI-WEAR CHEMISTRY

Synthetic Multi-Viscosity Hydraulic Oil features a shear-stable formulation fortified with the latest zinc-type anti-wear additives. It meets the stringent viscosity retention requirements of Parker Hannifin (Denison) HF-0 and demonstrates excellent anti-wear performance and compatibility with yellow metals in standardized laboratory and pump manufacturer tests (see below). Synthetic Multi-Viscosity Hydraulic Oil demonstrates excellent protection for pumps, motors, valves and other components against wear.



APPLICATIONS & SPECIFICATIONS

The correct viscosity grade of AMSOIL Synthetic Multi-Viscosity Hydraulic Oil is recommended for high- and low-pressure gear, vane and piston stationary and mobile hydraulic systems, including those with bronze metallurgy.

It is recommended for all types of applications requiring the following industry and equipment specifications:

STOCK CODE	HVG	HVH	HVI	HVJ
Parker Hannifin (Denison) HF-0, HF-1, HF-2		X	X	X
Vickers I-286-S, M-2950-S		X	X	X
DIN 51524 Parts 2 & 3		X	X	X
Cincinnati Milacron P-68		X		
Cincinnati Milacron P-70			X	
Cincinnati Milacron P-69				X

COMPATIBILITY

AMSOIL Synthetic Multi-Viscosity Hydraulic Oil is compatible with conventional petroleum oils and other synthetic lubricants, including brands popular in wind turbine operations.

AMSOIL MULTI-VISCOSITY HYDRAULIC OIL COMPATIBILITY CHART	
Texaco Rando WM 32	X
Shell Tellus S2 V 32	X
Mobil DTE 10 Excel	X
Shell Tellus S4 VX 32	X

See your wind representative for specific compatibility data for these oils.

HEALTH & SAFETY INFORMATION

For recommendations on safe handling and use of these products, please refer to the Safety Data Sheet (SDS), which is available upon request through the AMSOIL Wind Group at windsalesgroup@amsoil.com or (715) 399-6305.



SYNTHETIC TURBINE HYDRAULIC BRAKE OIL

Stock Code: THB

Product Profile

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AMSOIL Synthetic Turbine Hydraulic Brake Oil is an ISO VG 32 oil with an extreme operating temperature range engineered for superior performance and long oil life in industrial applications subjected to frequent low-temperature operation. Its high-quality synthetic base oils ensure exceptional fluidity in sub-zero temperatures for increased start-up performance, while its ultra-high viscosity index translates into good film thickness and wear protection at operating temperatures. AMSOIL Synthetic Turbine Hydraulic Brake Oil provides dependable operation throughout a wider temperature range than conventional ISO VG 32 hydraulic oils.

MAXIMUM WEAR PROTECTION

Formulated with molecularly uniform synthetic base oils, AMSOIL Synthetic Turbine Hydraulic Brake Oil reduces friction in valves, pumps and hydraulic system components for efficient operation and reduced wear. Its high-performance anti-wear additive package employs zinc to help ensure long component life and reduced maintenance costs.

LONG OIL LIFE

AMSOIL Synthetic Turbine Hydraulic Brake Oil is formulated with oxidation inhibitors that resist acid and sludge formation. Its robust formula reduces the need for frequent oil changes due to degraded oil or seasonal temperatures, making it ideal for extreme temperature ranges and applications that may be difficult to access. AMSOIL Synthetic Turbine Hydraulic Brake Oil's long-life properties help reduce maintenance costs.

PRODUCT FEATURES	USER BENEFITS
High viscosity index	Superior fluidity at low temperatures for immediate performance. Reduces possibility of pump cavitation in cold temperatures. Decreases the need for oil heaters. Reduces the need for seasonal oil changes for reduced costs. Provides a wider useful operating temperature range than conventional hydraulic oils.
Formulated with oxidation inhibitors	Promotes long oil life for maximum convenience and cost savings. Inhibits acid and sludge formation for a clean, efficient hydraulic system. Inhibits viscosity increase for optimum performance.
Excellent demulsibility	Better operation in humid and wet environments. Promotes water separation and improves filterability.
Seal friendly	Helps prevent leaks and extends seal life.
Foam resistant	Helps prevent pump cavitation and erratic operation. Allows for better protection and heat dissipation. Assists in maintaining fluid film thickness for increased wear resistance.
Long life	Reduces maintenance costs. Ideal for difficult-to-access applications.
Excellent filterability	Can be subjected to fine filtration for maximum cleanliness.

TYPICAL TECHNICAL PROPERTIES

AMSOIL Synthetic Turbine Hydraulic Brake Oil (THB)

ISO Viscosity Grade	32
Viscosity 100°C, cSt [ASTM D445]	9.5
Viscosity 40°C, cSt [ASTM D445]	33.9
Viscosity Index [ASTM D2270]	282
Specific Gravity (g/ml)	.8458
Density, (lb/gal)	7.042
Color	L0.5
Flash Point, °C (°F) (COC) [ASTM D92]	162 (324)
Fire Point, °C (°F) (COC) [ASTM D92]	188 (370)
Pour Point, °C (°F) [ASTM D97]	-55 (-67)
TAN [ASTM D664]	.28
Four Ball Wear Test [ASTM D4172] 75°C, 1200 rpm, 40 kg, 1 hr	0.45
Foam Tendency [ASTM D892]	10/0, 35/0,15/0
Oxidation Stability, Acidity mg KOH/g @ 1000 hours [ASTM D943]	1.96
Copper Corrosion 100°C, 3 hr [ASTM D130]	1A
Dialectric Strength, kV	41
Filtration Test (w/o water) ISO 13357-2	
F1 min.,%	96.4
F2 min.,%	97.2
Filtration Test (w/o water) ISO 13357-1	
F1 min.,%	91.8
F2 min.,%	82.5
Rust Procedure A [ASTM D665A]	Pass
Rust Procedure B [ASTM D665B]	Pass
FZG Load Stage Failure A/8.3/90	10
Demulsibility [ASTM D1401]	40-40-0 (15)
Vane Pump Wear Modified DIN ENISO 20763 (150°F)	
Ring Loss, mg	371
Vane Loss, mg	4.1
Vane Pump Wear [ASTM D7043]	
Ring Loss, mg	7.9
Vane Loss, mg	2.4
Shear Test 20 hr KRL %Viscosity Loss	29.14
METALS (ppm)	
Calcium	85
Magnesium	120
Sulfur	920
Phosphorus	420
Zinc	540

APPLICATIONS

AMSOIL Synthetic Turbine Hydraulic Brake Oil is designed for superior performance in hydraulic systems where the product viscosity and technical properties are appropriate for the application. An example may be hydraulics subject to cold-temperature conditions that require extra wear protection and long oil life.

HEALTH & SAFETY INFORMATION

For recommendations on safe handling and use of these products, please refer to the Safety Data Sheet (SDS), which is available upon request through the AMSOIL Wind Group at windsalesgroup@amsoil.com or (715) 399-6305.

THB BULK MODULUS AND THERMAL EXPANSION

ASTM 6793 ISO Thermal Tangent Bulk Modulus @ + 30°C

BM1000 (psig)	239557
BM2000 (psig)	250869
BM3000 (psig)	262439
BM4000 (psig)	274267
BM5000 (psig)	286355
BM6000 (psig)	298702
BM7000 (psig)	311308
BM8000 (psig)	324172
BM9000 (psig)	337295
BM10000 (psig)	350677

ASTM 6793 ISO Thermal Tangent Bulk Modulus @ + 80°C

BM1000 (psig)	189145
BM2000 (psig)	202483
BM3000 (psig)	216273
BM4000 (psig)	230515
BM5000 (psig)	245209
BM6000 (psig)	260355
BM7000 (psig)	275952
BM8000 (psig)	292001
BM9000 (psig)	308503
BM10000 (psig)	325456

ASTM D1903 Coefficient of Thermal Expansion

Specific Gravity 1 @ 25°C	0.8438
Specific Gravity 2 @ 65°C	0.8309
CTE	0.50959

SEAL DATA

Seal Compatibility DIN 53538 SRE-NBR1 Seals (168 hr, 100°C)

Volume Change %	+10.43
Shore A Hardness Change	-5



HEAVY-DUTY ANTIFREEZE & COOLANT

Stock Code: ANTHD

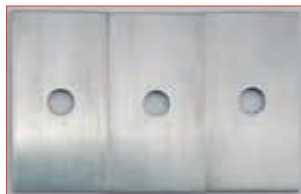
Product Profile

DEVOTED TO PROTECTION®

Antifreeze/coolants consist of either ethylene glycol (EG) or propylene glycol (PG) to provide freeze protection while also raising the boiling point of water. Additives are included in the formulation to protect against corrosion and scale deposits. Additives come in three types: inorganic salts (found in “green” conventional products), organic acids technology (OATs) and hybrid organic acids technology (HOATs). Organic acids (sometimes referred to as poly-organic acids) and HOATs are the most robust and long-lasting. They provide superior protection against scale deposits while offering excellent compatibility for maximum convenience. AMSOIL Heavy-Duty Antifreeze & Coolant is premixed 50/50 with ethylene glycol and high-purity water. It uses the latest organic-acid technology to provide outstanding protection while guarding against deposits.

HELPS PREVENT METALLIC CORROSION

Independent tests reveal AMSOIL Heavy-Duty Antifreeze & Coolant greatly surpasses standards for metallic corrosion, achieving nearly perfect scores in ASTM corrosion and erosion testing on cast aluminum, steel, copper, solder, brass and cast iron as well as aluminum water pumps.



Following ASTM D2570 corrosion testing, steel plates show no signs of corrosion.

HELPS PREVENT DEPOSITS

AMSOIL Heavy-Duty Antifreeze & Coolant is a poly-organic acid formulation that does not contain inorganic salts (phosphate, nitrate, nitrite, silicate, borate, amine) found in conventional and hybrid organic acid technology (HOAT) antifreeze/coolants. These materials are responsible for almost all scale deposits in cooling systems; the deposits often form when the antifreeze/coolant is at the wrong pH or mixed with incompatible products. AMSOIL Heavy-Duty Antifreeze & Coolant virtually eliminates scaling problems.

COMPATIBLE WITH OTHER FLUIDS

Antifreeze/coolants that use inorganic salts can be incompatible with each other, sometimes leading to additive drop-out in the form of an abrasive or slime. Determining product compatibility is a hassle and can lead to accidental mixing and maintenance issues. AMSOIL Heavy-Duty Antifreeze & Coolant does not contain inorganic salts, enhancing compatibility. It can be mixed with all ethylene and propylene glycol antifreeze and coolant colors, allowing operators to top-off any system regardless of the current antifreeze/coolant being used. However, mixing propylene and ethylene glycol formulations can make it difficult to predict freeze protection. If mixing for top-off is unavoidable, it is recommended to flush the cooling system at the next convenient opportunity.

Heavy-Duty Antifreeze & Coolant

- Formulated to exceed OEM requirements and maximize converter pump life
- Premixed 50/50 with high-purity water for maximum convenience
- Boil-over protection up to 265°F in a 15-psi closed system
- Freeze protection down to -34°F
- Protects seals, gaskets and hoses against leaks
- Fortified with anti-deposit, anti-fouling and water-pump lubrication additives
- High quality poly-organic acid formulation to help avoid IGBT/converter losses

APPLICATIONS

For use in wind turbine converter coolant applications and all passenger cars/light trucks, and applications requiring any of the following specifications:

ASTM D4985, D6210 • Case IH • Caterpillar EC-1 • Chrysler MS7170 • Cummins CES14603 • Detroit Diesel 7SE298, 93K217 • Fiat Professional; Fiat Truck • Ford WSS-M97B51-A1 • Freightliner 48-22880 • John Deere 8650-5 • Mack Truck CNH • MTU MTL5048, 5049 • New Holland • PACCAR: Kenworth, Peterbilt • TMC of ATA RP329, 330, 338 • US Military CID A-A-52624A

COMPATIBLE WITH SEALS, GASKETS & HOSES

AMSOIL Heavy-Duty Antifreeze & Coolant is compatible with all common seal, gasket and hose materials found in cooling systems. Its organic-acid chemistry helps promote long seal, gasket and hose life while helping reduce leaks.

LONG-LIFE FORMULATION

AMSOIL Heavy-Duty Antifreeze & Coolant does not contain inorganic salts that deplete over time and can turn into scale deposits. Its unique blend of organic acids provides durable and long-lasting protection of cooling system components.

DIRECTIONS FOR USE

- Follow the original equipment manufacturer's recommendations for top-off and service interval.
- Do not add water.
- Antifreeze/coolant (new or used) is hazardous. Clean up and dispose of properly following local regulations.

HEALTH & SAFETY INFORMATION

For recommendations on safe handling and use of these products, please refer to the Safety Data Sheet (SDS), which is available upon request through the AMSOIL Wind Group at windsalesgroup@amsoil.com or (715) 399-6305.



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COOLING SYSTEM FLUSH

Stock Code: CSF

Product Profile

DEVOTED TO PROTECTION®

Deposits often form in cooling systems due to improper maintenance practices or use of low-quality coolant or water. Deposits can plug passages and insulate surfaces, which can reduce heat transfer and cause overheating and expensive maintenance issues.

AMSOIL cooling system flush (CSF) is a safe and effective product for cleaning corrosion and scale deposits from cooling systems. Its surfactant-based technology is free of solvents, metasilicate and alkaline compounds. It offers improved compatibility with cooling-system components and coolant compared to harsh, acid-based cleaners.

GUIDELINES FOR USE

Antifreeze/coolant is hazardous. Clean up and dispose of properly following local regulations.

1. Drain coolant from system.
2. Fill cooling system with high-quality distilled or deionized water and 10% by volume AMSOIL Cooling System Flush.
3. Run system to operating temperature.
 - i. Ideally, operate the system at a fluid temperature of 180°F (82°C) for 1 hour.
 - ii. Run longer for cooler operating temperatures, not to exceed 4 hours.
4. Drain flush mixture from system. If possible, blow out lines with air to target 95% removal of flush mixture. If significant flush mixture remains after draining, refill with only high-quality water, run the system for a few minutes, then drain.
5. Refill the system with AMSOIL Heavy-Duty Antifreeze & Coolant.

HEALTH & SAFETY INFORMATION

For recommendations on safe handling and use of these products, please refer to the Safety Data Sheet (SDS), which is available upon request through the AMSOIL Wind Group at windsalesgroup@amsoil.com or (715) 399-6305.

AMSOIL Cooling System Flush (CSF)

- Cleans deposits to restore performance
- Safe for seals and hoses
- Neutral pH doesn't harm system components or reduce coolant performance



1 HOUR STEEL: A corroded steel coupon showing the effect of CSF. The CSF was heated to and kept at 82°C. The coupon was half submerged for one hour (left side).



2 HOUR STEEL: A corroded steel coupon showing the effect of CSF. The CSF was heated to and kept at 38°C. The coupon was half submerged for two hours (left side).



ALUMINUM: Two corroded aluminum coupons showing the effect of CSF. The two coupons were submerged in salt solution for two weeks to build corrosion and salt scale. A sample of CSF was heated to 82°C. The coupons were half submerged for 1 hour (right sides).



Devoted to Protection®

LINK CHAIN GREASE

Stock Code: LCGTB

Product Profile

DEVOTED TO PROTECTION®

AMSOIL Link Chain Grease is an NLGI #0 lithium-based extreme-pressure grease designed to help protect link-type load chains from corrosion and wear.

APPLICATIONS

AMSOIL Link Chain Grease should not be used where non-grease or dry lubricants are required by the hoist or chain manufacturer. Always follow the hoist and/or chain manufacturer's guidelines for the proper grease type, application method and frequency of chain lubrication.

HEALTH & SAFETY INFORMATION

For recommendations on safe handling and use of these products, please refer to the Safety Data Sheet (SDS), which is available upon request through the AMSOIL Wind Group at windsalesgroup@amsoil.com or (715) 399-6305.

TYPICAL TECHNICAL PROPERTIES

AMSOIL Link Chain Grease (LCGTB)

Thickener Type	Lithium 12-hydroxystearate
NLGI Consistency Grade	#0
Base Oil Viscosity 40°C, cSt (ASTM D445)	210
Base Oil Viscosity 100°C, cSt (ASTM D445)	17.5
Dropping Point, °F (ASTM D2265)	340
Oxidation Stability @ 100 hrs, psi (ASTM D942)	10
Rust & Corrosion (ASTM D1743)	PASS
Four-Ball Wear, mm (ASTM D2266)	0.45
Four-Ball EP kg (weld point) (ASTM D2596)	250
Timken OK Load, lbs (ASTM D2509)	40
Copper Corrosion (ASTM D4048)	1b
Color	Amber
Texture	Smooth
Package Size	Case of twelve 10oz. squeeze tubes



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Devoted to Protection®

SYNTHETIC MAIN BEARING GREASE

Stock Code: GMB

Product Profile

DEVOTED TO PROTECTION®

AMSOIL GMB grease is engineered specifically for use in wind turbine main bearings. Its unique combination of synthetic PAO base oils, lithium complex thickeners, and carefully chosen additives specifically solve common main bearing issues such as wear, rust, and grease deterioration or hardening. AMSOIL GMB grease works exceptionally well in large slow-speed bearings with high loads and in the moisture-laden environments that wind turbine bearings are subjected to.

AMSOIL GMB allows bearings to run freely with an ultra-low starting and running torque, yet provides excellent wear protection and causes less drag than competitive products.

AMSOIL GMB grease can be used in other applications and is an excellent choice for pitch and yaw bearings.

EXCELLENT COLD-TEMPERATURE PUMPABILITY

Provides extreme low-temperature pumpability and superior protection for equipment operating in harsh climates where temperatures drop well below freezing, ensuring superior load and wear protection.

SUPERIOR PROTECTION

Lithium complex thickener delivers structural stability. Low frictional resistance contributes to low-operating main bearing temperature and high efficiency.

TYPICAL TECHNICAL PROPERTIES Synthetic Main Bearing Grease (GMB)

NLGI Grade	1.5
Thickener Type	Lithium Complex
Color, Visual	Neutral
Penetration, Worked, 25°C, mm (ASTM D217)	309
Dropping Point, °F (ASTM D2265)	278
Viscosity of Base Oil @ 40°, cSt (ASTM D445)	460
Viscosity Index (ASTM D2270)	181
Four-Ball EP Test, Weld Load, kgf (ASTM D2596)	250
Four-Ball Wear @ 60°C, Scar Diameter, mm (ASTM D2266)	0.42
Water Washout @ 60°C, %wt. (ASTM D1264)	2.13
Emcor Test with 1% NaCl Solution, Rating (ASTM D6138)	0/0
Corrosion Protection, Rating (ASTM D1743)	PASS
Fretting Wear, wt. Loss, mg (ASTM D4170)	2.6



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Devoted to Protection®

FLUSHING OIL

Stock Code: MBF

Product Profile

DEVOTED TO PROTECTION®

Flushing Oil is a low-viscosity oil designed for flushing used grease from wind turbine main bearings. Its natural solvency helps quickly remove old thickeners and base oils, while its low viscosity assists with removing particles.

TYPICAL TECHNICAL PROPERTIES

AMSOIL Flushing Oil (MBF)

VK 40°C cSt (ASTM D445)	2.3
SpGr – g/ml (ASTM D1298)	0.8044
Density – lb/gal (ASTM D1298)	6.697
Flash Point °C (°F) (ASTM D92)	86 (187)
Pour Point °C (°F) (ASTM D97)	-52 (-62)

APPLICATIONS

Main Bearing Flush should be used with industry-approved main bearing grease-change procedures that expressly require the use of low-viscosity oil.

HEALTH & SAFETY INFORMATION

For recommendations on safe handling and use of these products, please refer to the Safety Data Sheet (SDS), which is available upon request through the AMSOIL Wind Group at windsalesgroup@amsoil.com or (715) 399-6305.

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**AMSOIL
PTN 320**

IS RUNNING IN

**OVER
25,000**

**MW CLASS
TURBINES
GLOBALLY**

AMSOIL[®]

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CUSTOMER TESTIMONIAL

HOW AMSOIL USED DATA TO SAVE A CUSTOMER \$105,000

In early 2019, an AMSOIL customer had an upcoming oil change that had been scheduled based on the industry-standard time interval of 7 years. When they approached AMSOIL to purchase more lubricant, AMSOIL asked to look at their data. Oil analysis showed that the oil was still performing at a level consistent with new oil, and the customer was able to put off oil changes for the foreseeable future.

AMSOIL turned down a sale from an established customer, saving them over \$105,000 in capital expenses. This level of support is extended to all established and potential customers of AMSOIL.

“

AMSOIL has saved us money both in material and time. Water separator filtration has been removed, and time intervals between oil filter replacement have increased. We budgeted for gearbox oil changes in 2019; however, following AMSOIL's review of oil analysis results, they informed us that the current 7-year-old oil quality is comparable to new, so they didn't see the benefit in changing at this time. Each year of extended operation provides substantial savings to our O&M budget.

”

OIL ANALYSIS PROGRAM

Let AMSOIL upgrade your current lab testing experience by providing professional oil analysis reporting.

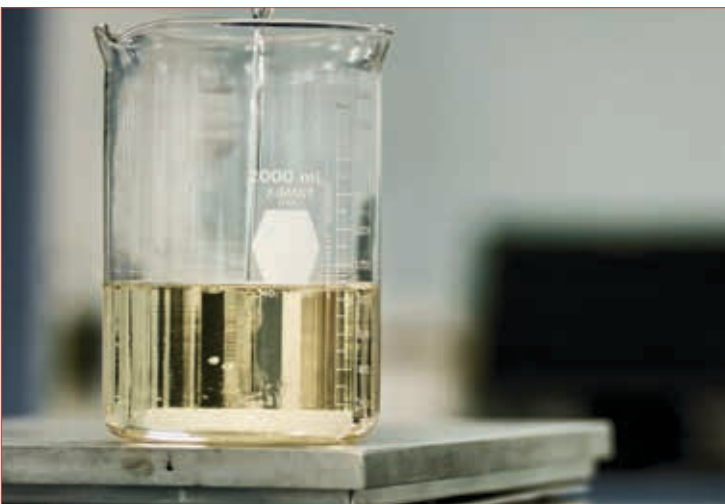
Testing samples will be sent in for testing with customized AMSOIL reporting to follow. As needed, meetings will be arranged to summarize the report and indicate any necessary action items by a team of AMSOIL lubrication experts.



BENEFITS

Having AMSOIL experts evaluate your lubricant to determine critical problems allows you to address any lubricant concerns before they become major issues. Not relying solely on the laboratory for interpretation of results has the following benefits:

- Maximize Equipment Lifespan
- Reduce Lubricant Consumption
- Reduction in Unscheduled Downtime
- Proper Filtration Techniques and Requirements
- Maintenance Cost Savings





DEVOTED TO
PROTECTION[®]



Devoted to Protection[®]

DEMAND QUALITY. DEMAND PROTECTION. DEMAND AMSOIL.

AMSOIL Synthetic Power Transmission Gear Lube protects longer than any other gearbox lubricant on the market – without the use of top treats. With more than ten years of proven results and an industry-leading warranty, we've captured the attention of asset managers who want to reduce downtime and maintenance costs. The OEMs are now following owner/operators' lead and transitioning to AMSOIL products on a global scale.

You now have a choice previously unavailable from your OEM.

The global leader in wind gearbox oil reliability and performance.

FIND OUT MORE AT **AMSOILWIND.COM**

You'll also find up-to-date information on manufacturer approvals, product compatibility, approved oil-change vendors and technical articles.



FORTY-YEARS OF QUALITY FOR CUSTOMERS

AMSOIL is not a one-size-fits-all company. We manufacture high-end products individually tailored to deliver maximum performance and protection for their intended application. Our wind turbine products are no exception. Power-generating wind applications around the globe present unique challenges that can only be addressed with custom solutions. That's where we come in. We specialize in solving customers' problems, which is something we've been doing since 1972. While others have followed our lead, none compare to the real thing.

Accept no substitutes. AMSOIL is *The First in Synthetics*.

DEVOTED TO QUALITY

AMSOIL gets it right the first time. We invest heavily in product research to remain at the industry forefront. It's what sets us apart from the competition. This intense care for quality is what keeps our customers so fiercely loyal to AMSOIL products.

Our on-site test facilities feature the sophisticated instruments needed to develop cutting-edge technology. We hold ourselves to higher quality standards to ensure customers get a product with unparalleled wear protection.

DEVOTED TO INNOVATION

AMSOIL products are designed to excel in the extreme conditions common to wind turbines.

AMSOIL innovations:

- Repels water
- Non-foaming
- No additive loss
- Top micropitting protection
- Extended gearbox life
- Outperforms competition for wear control in 13 field tests
- Extended oil and filter life
- No corrosive wear
- No viscosity loss

No other lubricant can match our wear protection.

DEVOTED TO OUR CUSTOMERS

AMSOIL develops products that deliver. As a family-owned company that isn't beholden to stockholder demands, we maintain the freedom and flexibility to make business decisions with quality and customer-care at the forefront.

AMSOIL was founded on the American ideals of entrepreneurship, innovation and hard work. Those qualities are baked into everything we do – from the service we provide to the products we manufacture.

WITH AMSOIL YOU GET A GLOBAL PARTNER

AMSOIL MEETS THE UNIQUE DEMANDS OF WIND TURBINES

Applications as sophisticated as wind turbines require an equally sophisticated lubricant for maximum protection and performance – all backed by an industry-leading long-term warranty. AMSOIL Synthetic Power Transmission EP Gear Lube delivers superior wear control, anti-foaming properties, water resistance and filterability.



PROVEN WATER RESISTANCE

AMSOIL Synthetic Power Transmission EP Gear Lube demonstrated a low average of 92 ppm of water for maximum effectiveness and component life.



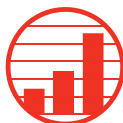
ENGINEERED WEAR CONTROL

AMSOIL Synthetic Power Transmission EP Gear Lube is designed for excellent viscosity retention.



SUPERIOR FOAM CONTROL

AMSOIL Synthetic Power Transmission EP Gear Lube resists foaming to deliver the correct fluid film thickness.



CONSULTATION

AMSOIL wind energy experts consult with operators on how best to use their oil analysis programs.



ON-SITE, UP-TOWER SERVICE

AMSOIL provides a team of safety- and rescue-trained wind energy experts to work on-site and up-tower to direct the lubrication process.



PROVEN FLUSHING PROCEDURE

Oil change procedures that fit the needs of every customer.

ON-SITE, UP-TOWER SERVICE

Our world-class engineers work on-site and up-tower to optimize your lubrication program. We'll guide you through the entire process from proper oil changeover to understanding oil analysis. Maximizing operational efficiency and dialing in maintenance programs is what we do.

CONSULTATION

Our consultation team will work with your operators to examine your operation and recommend specific test methodologies that accurately reveal gearbox condition. AMSOIL consultation services help you identify the maintenance practices most likely to increase efficiency and profitability.

**Technically driven. Customer focused.
Number one in global wind gearbox oil
reliability and performance.**

FIND OUT MORE AT **AMSOILWIND.COM**



Devoted to Protection®

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